process. Though the sea-urchin is thus a vegetarian, yet near the fishing stations it may often be seen to feed greedily on the garbage of the fisheries, but I have not known it to attack living animals. I fancy that its mode of life at Tadoussac, where it is found in great abundance, may be taken as representing its natural habits, when remote from places where the offal of fisheries and similar matters may be found.

THE ROYAL FAMILIES OF PLANTS.

BY C. M. TRACY.

THOSE who study plants divide them into groups which they call families. This arrangement both expresses very closely the system of nature, and commends itself to the student as being at once pleasant to contemplate and easy to understand.

These families of plants are in one respect like those of men: they have their distinctive characters, and transmit them onward, from generation to generation, with great steadiness; but, as every likeness is apt to be balanced by a difference, these, unlike their human prototypes, never intermingle, but keep a lineal succession more pure and guarded than even that of the children of Israel.

In countries where the "divinity that hedges kings" is more readily admitted and revered than among us, mention is largely made of families termed "royal." By virtue of blood more pure, or strong, or ethereal, than runs in plebeian veins, these are supposed to furnish candidates for the diadem, whose claims are to be adjusted only by and among themselves, no competitor from without being recognized for a moment. Now without stopping to discuss the rights and wrongs of this question in the light of

political science, it is enough to observe, that these "royal families" have always attained their eminence, no doubt, through some high qualification of wisdom, courage, enterprise, or wealth. Some fortunate exhibition of a strong trait has compelled an acknowledgment of prerogative from the popular mass, and this advantage the recipients have been extremely careful to maintain.

On looking over the families of plants, we find royal ones there also. There are four relationships of this kind that tower above all the host that surround them.

> "He above the rest,
> In shape and gesture proudly eminent
> Stood like a tower."

Perforce, we must call them royal. The chief of the four is the family known as the Composites, or, as we prefer to call them, the Asterids.

The eminence of this vast group was very early recognized. The sagacious Ray had, by the year 1700, come to see its greatness so clearly, that, instead of a mere family, or order, he was willing to call it one of the primary divisions of the great Vegetable Kingdom. No other relationship unites such an enormous number of plants. Lindley, in 1853, reckoned the distinct species at nine thousand, and these as making one thousand and five secondary sets or genera. His estimate for the total of all known plants of every sort, is ninety-two thousand, nine hundred and thirty, so that, practically, we shall find just about one of these plants in every ten we may gather, taking the world over. There is no other case that affords any comparison with this. These plants are met with all over the globe, excluded neither from the tropics nor the arctic valleys, and taking rank and position, it seems, very much as suits them, irrespective of latitude. In Sicily, Presl found more than one to every other plant,

or more than half the whole flora of the island. In Majorca and its companion isles, Cambessedes says they are equally plenty. Humboldt reckons every seventh plant in France to be one, every eighth in Germany, and every fifteenth in Lapland; while in North America he finds one in every six, and on the same continent within the tropics, fully one half of the whole. The immense sweep of this family is not seen in location and numbers only. They possess every variety of stature and form. They are annuals, biennials, and perennials; the Daisy and Dandelion have no true stems at all, the Chamomile and the Cudweed are not two inches high, while the Composites of St. Helena are chiefly trees. The Hempweed climbs over bushes, and the Sweet Golden Rod lies flat on the ground. They take possession of all soils; the Marsh Fleabane demands the daily drenchings of the sea, the Dwarf Dandelion affects the dry shelves of rocky uplands, and the Sweet Everlasting is equally pleased with both. Among those of any given division, there is yet no restriction or fetter, for if we look at our garden annuals, we find the Golden Crepis making a mat upon the earth, and the great Sunflower, the most immense of annuals, throwing up its tree-like stem full of enormous flower heads, till, without a figure, "the fowls of the air may lodge in the branches thereof."

But how is this royal order to be recognized by the vulgar? How may the common, unbotanical eye, detect the badge of such a vegetable nobility? Not without some slight examination certainly, yet a slight amount is enough. They are called "Composites" or compound flowers, and this gives the strong point in the case in a word. A Pink or a Potato-bloom is *one flower*. It has only one set of organs composing it, and its fruit, wheth-

er pod or berry, is one and indivisible, though it may contain many seeds. So of the Apple flower and the flower of the Oak, and in short of every other flower whatever, except those of these *Asterids*. These reverse this rule entirely. What appears as one simple blossom in the Sunflower is really an assemblage of several hundreds. Every seed produced in the autumn had its separate and individual little flower, complete in all its parts; for no one of these originates more than one seed, and besides, there are some at the centre that never ripen their seeds, and also a row of broad-leaved, showy yellow ones round the margin that form no seeds at all.

Now these two features—the gathering together of many small flowers in one head, surrounded by a few green leaves, and the production by each flower of one seed and one only—these are two of the three marks that will identify this family everywhere. The third is rather more minute. In all perfect flowers, of every kind, there are two kinds of organs concerned in fertilization, and known as *stamens* and *pistils*. The latter always stand in the centre of the flower, and however numerous they may be, nothing is found interior to them. The stamens, on the contrary, are always more or less in a circle, immediately surrounding the pistils. A stamen consists, usually, of a knob more or less lengthened in its form, termed an *anther*, and borne on a thin stem called its *filament*. The reader need remember no more definitions just now. The third character of the Asterids then is, that in every one of their small flowers the five long anthers of as many stamens grow together round the one pistil, into a straight tube through which the pistil reaches; while the filaments, below the anthers, are wholly distinct.

So, then, the most unpractised hand may identify the

members of this most royal family by these three badges: 1, flowers collected into a compound head. 2, one single seed to each flower. 3, five anthers grown together in a tube round the pistil.

There are but three other families whose structure tends to confound them with these. These marks are even more decisive than the thick lip of the Hapsburghs. The five anthers of the Lobelids grow together just in the way described, but their flowers are never in heads, and their pods have many seeds. The Dipsacids, or Teazles, have flowers gathered in heads in exactly the manner of Composites, but the stamens are entirely free from each other throughout. Then there is a remarkable little family of herbs in South America, known by no common name at all, but we will call them Calycerids. They have small simple flowers in heads too, and single seeds, but the anthers are separate, or nearly so, while the filaments grow together instead. So there is very little need to mistake any of these several orders for the true royal line. The only plant that commonly meets us with any such delusive tendency is the Scabiosa, or Mourning Bride, of the gardens, which belongs with the Teazles. It grows and appears a good deal like a Composite; but if one looks in the centre of one of the small separate flowers, he sees the five stamens all perfectly distinct, and the thing is settled.

A very notable circumstance attending this family, and one going strongly to prove its royalty, is that its whole immense series produces hardly any food for man or beast. Lettuce, Dandelions, and Artichokes are the very best it can do in this way; of less account are Chicory and Salsify, hardly food at all, either of them. There are very few regal houses that boast of less utility. Medicines are not wanting among them; Arnica, Wormwood, and

Thoroughwort have a good reputation, and Chamomile flowers have scented the saddle-bags of every village doctor since the days of the Pilgrims. We will not forget, besides, that excellent oil is obtained from some; such a plant is largely raised in India for this purpose, where they call it Ramtil. Sunflower seed produces oil, it is said, but a species of Madia seems, according to experiments in Europe, to have great superiority as an oil-bearer. Pasquier informs us that it gives as much oil to the acre as Poppies, twice as much as Olives, and thirty-two parts where Linseed yields only twenty-one.

To those who love floral display, however, for its beauty alone, caring little for the degree of more material usefulness that may be found in connection, the great family of the Asterids is a perfect treasure-house. They swarm in every garden, they shine in every green-house, and no bouquet is complete without them. The Sunflower and Marigold bring their "barbaric pomp and gold," the Dahlia, a hundred hues and all splendid, forever tempting the gardener, and forever disappointing him; the Asters have piquant sprightliness, and the Daisies and Feverfews a pure and lovely modesty. Then we have Gaillardias, Pyrethrums, Humeas, Rhodanthes, Cacalias, Gazanias, Centaureas and Catamanches, some of which have common names, and more have none, all replete with beauty, and sure to be favorites wherever flowers are reckoned with the beloved. Nor must there be forgotten, at the end of all, just as "hale, concluding winter comes at last, and shuts the scene," the sterling Chrysanthemums, ever choice with the florist, ever grateful for the gardener's care, ever heedless of frost and chilly wind, and ready to bind a fresh wreath round the brow of the eldest December.

Thus much for the greatest of the Royal Families of Plants. Of the others we may speak hereafter. Their importance is not less than we have ascribed to these, and in some respects they far outvie the great division before us. From the study of their extended ranks we can but gain instruction; from their wonderful involutions there will still shine out a new light on the workings of that Spirit at whose bidding "the earth brought forth grass, the herb yielding seed, and the tree yielding fruit after its kind."

THE MOSS-ANIMALS, OR FRESH WATER POLYZOA.

PLATE 4.

BY ALPHEUS HYATT.

(Continued from p. 63.)

THE blood of the Phylactolæmata is colorless, resembling in this respect that of most of the lower animals. It is composed of the liquid products of digestion, which exude through the membranes of the stomach, diluted with water drawn in through innumerable pores perforating the wall of the tube. The water is the medium of conveyance for the gelatinous, nutritious liquid, probably facilitating its carriage to remote parts.

There is no organ resembling a heart to keep the blood moving, and there are no closed channels, such as arteries and veins, to conduct it among the tissues of the body. The absence of the first is supplied by cilia, which cover the interior of the tubes and cells with a dense, velvety nap, and by their unceasing vibrations sustain a healthy circulation. The course of this may be traced by the numerous floating parasites, beings of the simplest or-